



Academic mentoring, diversity, and leadership

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The Problem: a little history

Diversity

— *specifically women and underrepresented minorities* —
in general population is not reflected in academic engineering.

Why is this a problem?

Because contributes to lack of diversity in profession:
in research, development, and general practice

Why is this a problem?

Wasted potential

Diversity improves climate for research and development

...

At the beginning of the millennium numbers were awful, e.g., only 8.2% of PhDs granted in EE in the US during 1985-2001 were to women.

Women faculty numbers also bad:

Percentage of Women in a few EE/ECE/EECS Faculties in 2002

University of Delaware	0%	UC Berkeley	11%
UCSD	2%	Penn State	11%
USC	4%	Stanford	11%
Cal Tech	5%	Cornell	13%
UT Austin	5%	University of Washington	20%
Princeton	7%	Duke	30%
University of Michigan	7%		

Lots of excuses in those days, but some did better than others!



7 of the 9 Women in the 2002 UW EE Department

By 2010,

Institution	% women	total faculty
CalTech	19.2%	13
Duke	18.5%	27
University of Washington	17.5%	40
UCLA	13.0%	46
U Wisconsin	13.0%	38.5
RPI	12.8%	39
MIT	12.0%	151
Georgia Tech	11.4%	114
Texas A&M	11.1%	72
Princeton	10.9%	27.5
Purdue	10.8%	83
Rice	10.0%	20
U Michigan	9.8%	71
UC Berkeley	9.8%	40.5
Top 50 Average (2007)	9.7%	
Cornell	8.8%	34
Stanford	8.6%	41.5
Carnegie-Mellon	8.2%	49
U Illinois	8.2%	85
Northwestern	7.8%	51
NC State	7.4%	54
U Maryland	6.8%	62
UT Austin	5.0%	68
USC	4.9%	61
UCSD	3.8%	52

↑ 10.5%, 42.5 in 8/2010

Rigorous statistics [Donna J. Nelson and Christopher N. Brammer, *A National Analysis of Minorities in Science and Engineering Faculties at Research Universities: Second edition*, January 2010]:

Table 11. Women in the Academic Pipeline*

Discipline	Students				Departments 1 - 100 FY2007			
	BS2004	BS2005	PhD86-95	PhD96-05	asst	assoc	prof	all
Chemistry	51.0%	51.7%	26.3%	32.4%	21.2%	19.6%	9.7%	13.7%
Math	46.1%	44.9%	22.5%	28.7%	26.8%	18.4%	7.1%	12.9%
Computer Sci	24.7%	22.0%	19.8%	21.2%	20.0%	11.6%	10.3%	13.2%
Astronomy**	41.5%	42.4%	15.2%	22.7%	25.3%	21.6%	12.3%	15.8%
Physics	21.6%	21.1%	10.8%	14.3%	16.8%	13.4%	6.1%	9.1%
Chemical Engr	35.6%	36.7%	17.1%	23.7%	24.2%	17.6%	7.3%	12.6%
Civil Engr	24.1%	23.9%	12.7%	22.0%	24.7%	14.5%	7.1%	13.0%
Electrical Engr	14.0%	12.9%	8.6%	12.3%	15.5%	12.5%	5.7%	9.5%
Mechanical Engr	13.7%	13.2%	7.3%	8.4%	18.0%	11.9%	4.4%	8.8%
Economics	32.5%	31.5%	25.7%	30.2%	30.8%	20.3%	8.7%	16.3%
Political Science	51.1%	51.0%	32.8%	38.9%	37.0%	29.3%	17.6%	26.1%
Sociology	71.5%	70.5%	53.4%	60.8%	56.1%	45.7%	28.2%	39.8%
Psychology	77.8%	77.8%	59.1%	67.8%	48.5%	43.9%	29.5%	37.3%
Biological Sci	62.5%	62.2%	39.6%	46.3%	35.0%	30.0%	17.4%	24.4%
Earth Sciences	42.1%	41.9%	22.5%***	31.8%	28.2%	20.9%	11.3%	16.5%

*Females were 50.7% of the 2006 US population. **Top 40 departments. ***1995 data only.

Table 12. Female Professors by Rank and Year at Top 50 Departments

Discipline	FY2002*				FY2007			
	Assistant	Associate	Full	All Ranks	Assistant	Associate	Full	All Ranks
Chemistry	21.5%	20.5%	7.6%	12.1%	21.7%	21.3%	9.7%	13.7%
Math	19.6%	13.2%	4.6%	8.3%	28.0%	15.5%	7.2%	12.1%
Computer Sci	10.8%	14.4%	8.3%	10.6%	19.5%	11.3%	11.5%	13.5%
Electrical Engr	10.9%	9.8%	3.8%	6.5%	14.5%	14.1%	6.2%	9.7%
Mechanical Engr	15.7%	8.9%	3.2%	6.7%	18.2%	12.0%	4.9%	9.0%
Physics	11.2%	9.4%	5.2%	6.6%	17.5%	12.6%	6.8%	9.5%
Civil Engr	22.3%	11.5%	3.5%	9.8%	25.3%	14.3%	7.1%	12.7%
Chemical Engr	21.4%	19.2%	4.4%	10.5%	23.7%	17.8%	8.3%	12.9%
Astronomy**	20.2%	15.7%	9.8%	12.4%	25.3%	21.6%	12.3%	15.8%
Economics	19.0%	16.3%	7.2%	11.5%	30.7%	16.0%	8.5%	15.1%
Political Science	36.5%	28.6%	13.9%	23.5%	35.9%	30.1%	17.4%	25.6%
Sociology	52.3%	42.7%	24.3%	35.8%	57.9%	45.6%	28.0%	39.7%
Psychology	45.4%	40.1%	26.7%	33.5%	44.9%	41.9%	29.9%	36.0%
Biological Sci	30.4%	24.7%	14.7%	20.1%	36.0%	30.9%	17.7%	24.8%
Earth Sciences	not available				28.6%	21.7%	10.6%	16.1%

*Chemistry and astronomy data are for FY2003. **Top 40 departments

Serious problems of pipeline and pool.

Critical bottleneck: engineering faculty —

★ small numbers can have a major impact ★

4% of all US female EE Professors in 1996 from one supervisor

By 2002 only 3.2% of top 50 schools, but = 7.6% of all female EE *Full* Professors in top 50, 2.4% of all women IEEE Fellows

Small increases \Rightarrow large %, more role models, more diverse experience, more effective faculty \Rightarrow draws more students . . .

Individuals count heavily

Are things any better in 2016?

I retired in 2013, I don't know,

but at the end of 2015 \Rightarrow

School of Engineering
 Department of Electrical Engineering
Faculty Demographics by Gender
 September 1, 2015

School of Engineering				
School	Rank (broad)	Female	Male	Total
Engineering	Assistant Professors	11 22%	40 78%	51 100%
	Associate Professors	9 18%	41 82%	50 100%
	Professors	18 11%	139 89%	157 100%
Total		38 15%	220 85%	258 100%

Department of Electrical Engineering				
Department	Rank	Female	Male	Total
Electrical Engineering	Assistant Professor	3 38%	5 63%	8 100%
	Associate Professor		5 100%	5 100%
	Professor	2 5%	36 95%	38 100%
Total		5 10%	46 90%	51 100%

(actually it's $5/51=9.8\%$)

UCSD $5/52=9.6\%$ ↑, Caltech $3/19=15.8\%$ ↓, U Washington 17% ↓

Some thoughts on what works and challenges

2 Key goals for improving faculty numbers and quality of life:

- Active faculty recruiting across a wide spectrum:

Fair and open searches (Denice wrote the book.)

The richer the pool discovered in a search, the better the final candidates. (Basic principle of optimization)

In the words of Denice Denton: *It's a search committee, not an envelope-opening committee.*

a major leadership challenge! — dealing with residual and often unconscious bias, educating search committees (who often see no problem reproducing themselves)

- Creating a respectful, productive, and fulfilling environment

another leadership challenge

These things don't happen without good leadership. Potential leaders need to be recruited, encouraged, and mentored for leadership in research, teaching, and administration:

Group Leader, Lab director, Center Director

Departmental Committee, Committee Chair

Department Executive Committee,, Faculty Senate

Department Chair or Director , Dean (Associate, Vice, etc.)

Provost, President (Associate, Vice, etc.)

Professional Organizations (IEEE, ACM, etc.): Editorial, Officers

Leadership takes valuable time from other pursuits and not everyone is suited for it,

but give it serious consideration

Pros and Cons for devoting time to academic leadership include

Good	Bad
Impact Leave institution better Promoting worthwhile projects New directions Develop new skills	Time Politics Fundraising Herding cats Requires new skills

Common paths: from junior to senior in natural progression, e.g., leading small peer group, associate chair, chair, dean, provost, president

Not all paths are so linear! E.g., sideways moves, find optimum level

Do some research and give it some thought. Opportunities can arise by surprise, be ready to decide. If opportunities don't arise, seek them out.

Denice was good at spotting talented people and offering them a chance, often by assisting her and then taking over a project.

Start small to learn skills and gain experience. Risky to take on too high a position without preparation and experience.

My 2 favorite sources of accumulated wisdom on mentoring for engineering academia faculty are [1] Chapter 7 of *Mentoring for Academic Careers in Engineering* (2004) and [2] Chapter 3 of *Mentoring for Engineering Academia II* (2007)

During 22-27 July 2007 a workshop was held at the Banff International Research Station (BIRS) in Alberta, Canada, to bring together students, faculty, and representatives of academic administration to collect, invent, discuss, develop, and document ideas on how individuals and groups within academic environments can effectively promote awareness and progress in mentoring for careers in academic engineering, especially for women and underrepresented minorities. This book provides a distillation of the presentations and discussion of a variety of topics, including the fundamentals of mentoring, mentoring for academic leadership, ensuring fair and open searches, balancing faculty and family responsibilities, managing and evaluating mentoring, outreach, and building mentoring programs.

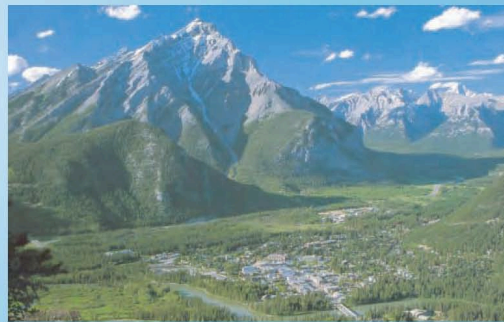


Graphics Publishing

Mentoring for Engineering Academia II

Mentoring for Engineering Academia II

Proceedings of a
Banff International Research Station
Workshop



 **Banff International Research Station**
for Mathematical Innovation and Discovery

Dedication of BIRS 2007 workshop: *These Proceedings are fondly dedicated to Denice Dee Denton (27 August 1959 – 24 June 2006) whose mentoring abilities, academic leadership, and humor inspired generations of engineering academics.*

<https://dl.dropboxusercontent.com/u/106260653/birs07proceedings.pdf>

Close with a few examples from [2]:

Sample Nuggets of Advice

- Think broadly about leadership. It is not just administration.
- Be positive.
- Get training.
- Build your own village of mentors.
- Prioritize your commitments. A dean will sacrifice a precious research day when a meeting with alumni might yield a million dollar donation.
- Recognize and exercise opportunities to grow into leadership roles and positions.
- Think impact. What can you change? What can you make better?

If it's a good idea, go ahead and do it. It's much easier to apologize than it is to get permission. — Grace Murray Hopper



Denice in 2006